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How do firms interpret a job loss? Evidence from the National Longitudinal Survey of Youth

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Abstract

Empirical studies in the job displacement literature have found that workers face significant earnings losses on average, when they are permanently displaced from jobs. Previous research also suggests that the costliness of job loss varies widely. Gibbons and Katz (1991) develop and test a theoretical model in which layoffs provide the market with information concerning the quality of laid off workers, while plant and firm closings do not. Using data from the National Longitudinal Survey of Youth, this paper tests a model that describes how firms can use additional information about job losses to determine worker quality. The results suggest that workers face the most stigma from very recent and uncommon job losses.

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1.) Introduction

Theoretical and empirical evidence suggests that the conditions under which a worker loses a job may affect post-displacement wages (Gibbons and Katz, 1991). I extend the theory to model firms as using all available information about a worker's job loss to determine wage offers to displaced workers. Using a probit and subsequently a bivariate probit model, firms are modeled as calculating the probability of job loss for each worker, and use these estimates to determine the likelihood of a job loss. For example, firms may use the unemployment rate at the time of the job loss as proxy for local labor market conditions. As the number of layoffs in the local economy increases, so does the expected marginal productivity of a laid-off worker, reducing the stigma associated with layoffs. One distinct advantage of this approach is that through the construction of the bivariate probit model, I can examine the impact of early versus later career job displacements. Empirical findings from a sample of the National Longitudinal Survey of Youth 1979 (NLSY79) provide support for the hypothesis that firms use information about the circumstances of a job loss to assess the productivity of displaced workers.

2.) Previous Literature

Most studies in the job displacement literature focus on measuring the wage and earning losses of displaced workers. Several studies have used the Displaced Worker Survey (DWS) to quantify earnings losses due to job dislocation. The DWS is a nationally representative sample of displaced workers, conducted biennially in either January or February since 1984 as a special supplement to the Current Population Survey (CPS). Farber (1997) is an example of a typical study using the DWS.[1] Farber estimates the probability of job loss by education, sex, race, and year displaced. Using data from the seven DWS surveys from 1984 to 1996, Farber estimates that over the period from 1981-1995, real weekly post-displacement earnings were 13 percent lower than real weekly pre-displacement earnings, controlling for tenure.

Ruhm (1991) investigates long-term earnings losses using data from the 1969-1982 Panel Study of Income Dynamics (PSID) for a sample of 3,813 workers who were identified as displaced over the period. The sample is restricted to workers between the ages of 21 and 65 during 1971-1975 who were in the labor force for part of 1971. Excluding displacement from temporary and seasonal jobs, workers are defined as permanently dislocated if they were terminated because of plant closings or layoffs and did not return to the original employer within the end of the second year. This classification clearly differs from that in the DWS. In particular, workers fired for cause are included in the sample of layoffs. Also, as compared to the DWS, the available sample size is much smaller.

More recently, researchers have utilized additional longitudinal data sources. Using the NLSY79, Kletzer and Fairlie (2003) estimate the long-term costs of job displacement for young adults for the period 1984-1993, also using fixed effects. Significant earnings losses are found for this group of workers, although the earnings losses appeared shorter-lived for this group of younger than average workers, as compared to the results from the PSID, which samples workers of all ages. The authors

[1] I do not provide an exhaustive review of all studies in the displacement literature. A good survey of the literature is Kletzer (1998).

do not attempt to estimate any systematic differences between layoffs and plant closings, in the NLSY79.

One explanation for differences in the costs of displacement by type of job loss is the possibility that firms use the type of job displacement as some indicator of worker productivity. This research is motivated by the work of Akerlof (1976) and Spence (1973) in which asymmetric information concerning worker productivity can affect outcomes in the labor market. In particular, layoffs and plant closings have been identified as having different levels of stigma. Gibbons and Katz (1991) develop a model that assumes a worker's current employer has access to information concerning a worker's productivity that other potential employers do not. A hiring firm may be able to use the way in which a worker is discharged from the firm as an informative signal. The authors argue that workers displaced by plant or firm closing will face lower displacement costs than other types of job losers, since these types of separations provide no information regarding worker quality. Conversely, firms are assumed to layoff only lower quality workers and other firms will consequently offer these workers lower wages.

In a working paper, Nakamura (2004) develops and tests a theory connecting layoffs and stigma to the business cycle. In the model, workers are laid off either because of selection or bad luck. During recessions the proportion of workers laid off because of bad luck increases, diminishing the signal associated with a layoff. Nakamura (2004) uses a sample from the DWS and finds empirical evidence suggesting that during recessions the signal of worker productivity associated with a layoff decreases. Nakamura's work differs from my analysis is several important ways. First, the measure of labor market conditions is the national unemployment rate over the business cycle, whereas my focus is state unemployment rates.[2] Also, Nakamura (2004) utilizes only a cross-section of workers using the DWS; I conduct an empirical test using a longitudinal sample. However, the intuition concerning the link between the stigma of layoffs and labor market conditions is essentially the same. When many layoffs occur, the stigma associated with layoffs decreases.

3.) Data Description

The National Longitudinal Survey of Youth (NLSY79) is a nationally representative sample of men and women between the ages of 14 and 22 in 1979. The survey contains information concerning labor market experience, job history and mobility, demographic characteristics, along with many other variables of interest. The NLSY79 was administered annually from 1979 to 1994 and has been conducted biennially since then. Attrition rates have been low; of the 14,574 individuals selected in the full sample for interview in 1979, 12,686 participated.[3] In 1994, the total sample contained responses from 9,964 individuals. Part of the reason for the low attrition rates is that sample members not participating in any given year are still considered members of the sample and may participate in later years. Attrition is not generally thought to be

[2] An earlier version of this paper used local area unemployment rates, with similar results. I choose to use the state unemployment rates in the year of displacement to avoid reducing the sample size to only workers in metropolitan areas.

[3] Weinberg and Ship find that the retention rate of other commonly used surveys such as the Panel Study of Income Dynamics and the Survey of Income and Program Participation are approximately two-thirds of that of the NLSY after approximately twelve interviews.

random, and those leaving the survey are more likely to be less educated and not employed than the average respondent. MaCurdy, Mroz and Gritz (1998) examined the effects of attrition in the NLSY79 and find no evidence of any systematic bias resulting from non-random attrition.

For this analysis, the sample is restricted to males during the years 1984-1994.[4] Male workers are again the focus, since they are more likely to have some attachment to the labor force. The sample is also limited to those workers with some labor market experience at the beginning of the period, since the NLSY79 is a sample of younger workers and many individuals have not yet left school. A male worker is included in the sample if that individual was employed during the year 1984 at a job at which the worker reported working at least 20 hours a week. Subsequent information about jobs during the years for these workers is included, creating a balanced panel for the years 1984-1993.[5] I exclude workers that report being enrolled in school full-time in 1984, and workers who have no labor market experience during 1984.[6] These workers have less exposure to the labor market, which will likely affect the probability of a job loss over this period.

Individuals that report not working at any one of the five reported jobs during a year either because of a layoff or a plant closing are considered displaced provided that several conditions are met. First, temporary job losses are not considered displacements, and those workers who report returning to their employers after such a loss are not recorded as displaced. Additionally, individuals must have reported working at least 20 hours per week at the job in order for it to be considered either a layoff or plant closing. Real hourly wages in 1994 are used in the second-stage wage equation, so workers must also have worked in 1994 to be included in the sample.

4.) Empirical Methods: Single-Period Analysis

Firms may have more information regarding the conditions under which layoffs occur than simply the unemployment rate at the time of a job loss, and the type of displacement. In this section, I allow firms to observe each worker's history of job loss and also some worker and job specific attributes. Job loss is modeled using the following linear index function:

(1) $$y^*_i = \beta' X_i + \varepsilon_i$$

where it is assumed that y_i, the observed value of the job loss is:

$$y_i = \begin{Bmatrix} 1 & if\ y^*_i > 0 \\ 0 & if\ y^*_i \leq 0 \end{Bmatrix}$$

Although displacements are recorded by year, as a first step y_i is set equal to one if worker *i* is ever observed to be displaced during the period between 1984-1993. The initial specification treats plant closing and layoffs as identical, while later specifications

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[4] Workers displaced before 1984 are excluded from the entirety of the sample, since it is impossible to determine which type of job loss they faced.

[5] Throughout the sample there are some missing or miscoded variables for workers. I only exclude a worker if the missing variable is used in either the first-stage probit estimations, or the second stage wage equations, or if the variable affects the construction of each individual's work history, since these variables are used to calculate labor market experience.

[6] I do not exclude workers who return to school between the years 1984-1993, but I do exclude workers enrolled in school during 1994, the year in which I estimate the wage equation.

distinguish between layoffs and plant closings. In these later empirical specifications, I only include those laid-off workers that were never displaced by a plant closing, and those workers affected by a plant closing that were never laid-off.[7] The sample contains 2225 workers, of which 795 are displaced at least once during the period. The vector X_i includes worker-specific traits such as years of education, race, tenure, experience, annual area unemployment rate, geographic region, and industry and occupation specific characteristics. For simplicity, these variables are measured during 1984, the beginning of the period.[8] It is therefore assumed that firms, in 1994, have access to these worker and job-specific traits. Descriptive statistics for the variables used in the estimations are reported in Table 1.

For layoffs, there is a particularly clear interpretation of the index function. If a worker's marginal productivity is below some threshold, the worker is laid-off; otherwise the worker is retained. The vector X_i includes variables that affect this threshold, and therefore change the information contained in a layoff. For plant closings, the interpretation is less straightforward, since plant closings have been modeled as independent of any individual worker's productivity. However, one might expect that workers affected by plant closings could have lower post-displacement wages due to a loss of human capital or a loss of work experience. In fact, one might expect that the those wage losses would be largest for those workers affected by plant closings and who are predicted to be displaced by these closings.

I first assume that a firm estimates the probability of a job loss for each worker in the sample using a probit model. This requires the assumption that Prob(y_i=1)= $\int_{-\infty}^{\beta' x} \phi(t)dt$ and that $\varepsilon_i \sim N(0,1)$ where ε_i and ε_j ($i \neq j$) are independent, and where ϕ(t) represents the continuous normal probability distribution function.

This probability of a job loss is done via maximum likelihood estimation, and this value is then used in a second stage wage regression.[9] Specifically, the following equation is estimated:

(2) $$\ln W(1994)_i = \alpha' Z_i + \gamma' D_i + u_i$$

where $W(1994)_i$ is the hourly wage of a worker in 1994, Z_i is a vector of worker and job-specific traits for the worker in 1994, and D_i is a set of dummy variables based on both observed displacement and predicted displacement, for each worker. The vector D_i contains three dummies: a variable equal to one if a worker is displaced during the period 1984-1993 and the predicted probability is estimated above the mean of predicted probabilities, a second variable equal to one if a worker is displaced and has an estimated probability below the mean, and a third dummy equal to one if the worker is not observed to be displaced but has an estimated probability of displacement above the mean. A

[7] This restriction does eliminate some workers from the sample, since multiple types of job losses are possible for one particular worker. However, multiple layoffs are much more common that multiple plant closings. Only 87 workers are dropped from the sample because of this restriction.

[8] Industry and occupational characteristics are recorded for the job at which the individual worked the most hours at during a year for the probit model, and for the job at which the individual worked the most during 1994 for the second-stage wage equation.

[9] The predicted probability for each individual is simply: $p_i = \Phi(\beta' x_i)$, where $\Phi(\cdot)$ represents the cumulative normal distribution.

fourth dummy, equal to one if the worker is not displaced and has a predicted probability below the mean, is excluded. The vector Z_i includes all the variables in X_i, excluding marital status and number of children, although these variables are measured during the year 1994.

Results for the first stage estimations are presented in Table 2. Column (1) includes estimated coefficients for all displacements, while (2) and (3) separates layoffs and plant closings. Job tenure, experience, and education at the beginning of the period appear to be important statistically in determining whether a worker is displaced during that period. Not surprisingly, observable factors are less successful at predicting plant closings; this result provides more evidence that plant closings are independent of worker attributes. Broad occupational and industry factors at the beginning of the period are also surprisingly ineffective in predicting plant closings.

Second stage wage regressions are presented in Table 3. For the full sample of all displacements, workers that are displaced during the period but are not predicted to be displaced are estimated to have statistically significantly (with 95 percent confidence) lower real wages at the end of the period. Specifically, these workers are estimated to have 7.4 percent lower real wages, as compared to non-displaced workers, that are not predicted to be displaced. For the sample of laid-off workers (and non-displaced), this difference is estimated to be approximately 8.6 percent. No such findings exist for the sample of plant closing workers.

Interestingly, those workers affected by plant closing and that are predicted to be displaced are estimated to have lower real wages than the group of non-displaced workers, non-predicted workers.[10] This result perhaps suggests that workers affected by plant closings do have some estimated earnings losses, but that they are the result of predictable job or industry attributes, not any information contained in a plant closing. Also, workers that are not displaced, but have the characteristics of displaced workers, are estimated to have lower real wages than those non-displaced, not predicted displaced workers. Although this estimate is not statistically significant at any usual level of significance, its sign may be more evidence that a worker's attributes can affect later wages. Perhaps firms have alternative signals of these workers productivities, other than layoffs.

4.2.) Two-period Analysis

As stated earlier, one advantage of this two-stage analysis is that it is possible to examine the impact of early versus late job losses. The sample is now divided into two five year periods: 1984-1989 and 1990-1993, and the displacements in periods are modeled as determined for period one by:

(3) $y_i^{*1}(period1) = \beta' X_i^1 + \varepsilon_i^1$

and for period two:

(4) $y_i^{*2}(period2) = \delta'_i X_i^2 + \varepsilon_i^2$

[10] The estimated predicted difference is not statistically significant at any normal level of significance. Also, the sample of plant-closings is small at only 134 workers.

It is further assumed that $y_i^t = \begin{cases} 1 & if\ y_i^{*t} > 0 \\ 0 & if\ y_i^{*t} \le 0 \end{cases}$ for t=1,2, and where ε_i^1 and ε_i^2 are distributed bivariate normal, [0,0,1,1,: ρ], and where X_i^1 and X_i^2 are measured at the beginning of each period.[11] The parameter ρ measures the correlation between the errors of equations (3) and (4).

This specification has several advantages over a single period analysis. First, the effects of job losses are allowed to differ based on whether the loss occurred during two different periods in a worker's career, which will allow for a comparison of early versus later job losses.[12] Second, information regarding worker and job-specific characteristics during two points in a worker's career can be used to calculate probabilities of job loss. Finally, this modeling approach allows correlation between unobserved factors affecting the probabilities of displacement in each of the two periods. For layoffs it is likely that unobserved worker-specific attributes will affect the probability of a layoff in both periods, making ρ positive.

Results of the bivariate probit specifications are presented in Tables 4, 5, and 6 for all displacements, only layoffs, and only plant closings, respectively. As in the single-period probit, job tenure, experience, and education are statistically important in determining the probability of job loss in both periods for all displacement and only layoffs. Again, observable factors are less successful at predicting plant closings.

As previously mentioned, ρ measures the correlation in the two errors of the estimated probability of job loss in the two periods. A Wald test is conducted to determine if ρ is statistically different that zero. For all displacements, ρ is estimated to be approximately 0.061, and is statistically different that zero at the 10 percent level. The correlation in errors is stronger when plant closings are excluded, as ρ is estimated at 0.110, and is significant at the 5 percent level. Intuitively, the unobserved attributes that make a worker more likely to be laid-off in period one also increase the likelihood of a layoff in the second period. No such correlation is found for plant closings, which is more evidence suggesting that plant closings are unaffected by worker-specific traits.

As in the single-period analysis, the first stage estimations of the probability of job loss are used in a second-stage wage regression:

(5) $\ln W(1994)_i = \alpha' Z_i + \gamma^{1'} D_i^1 + \gamma^{2'} D_i^2 + u_i$

In this specification there are two sets of three dummy variables, one set from each period of job loss. These dummies are again calculated using the mean predicted probability as a cutoff value. The vector Z_i is again a set of worker and job-specific attributed for each individual, measured during 1994.

Results for these estimates are presented in Table 7. For the sample of layoffs only, a worker laid-off in the first period but not predicted to be laid-off, is estimated to

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[11] The bivariate normal cdf is $\int_{-\infty}^{x_2} \int_{-\infty}^{x_2} \phi_2(z_1, z_2, \rho) dz_1 dz_2$.

[12] This approach cannot account for the effects of multiple job losses that occur during the same five-year period. However, it is unclear how much additional information a firm may gain from observing a workers' loss of a job immediately following a previous job loss.

have approximately a 9.6 percent lower real wage, as compared to a non-displaced worker not predicted to be displaced. For layoffs in the second period, this percentage difference is estimated to be 11.3 percent.[13] This result provides additional evidence that a laid-off worker with attributes not consistent with layoffs incur a wage penalty. It also demonstrates that layoffs occurring both early and later in a worker's career have an estimated impact on post-displacement wages.

Those workers that are laid-off in the first period but have attributes consistent with layoffs also are estimated to have lower real hourly wages in 1994. As in the single period analysis, the magnitude of this coefficient is larger for plant closings. This result again suggests that perhaps there are some costs of job loss that are the result of predictable worker or job-specific attributes that do not have to do with the information contained in a layoff.

5.) Concluding Remarks

This paper provides evidence that firms interpret job displacements using all available information regarding workers and their job histories. In particular, I allow firms to construct an estimated probability of job loss for each worker, based upon worker and job-specific characteristics. Firms then use these probabilities to adjust their wage offers. My results suggest that real wages are lower for laid-off workers with below average predicted probabilities of displacement. Firms understand that these workers were less likely to experience a layoff, and lost their job because of their low marginal productivity. One distinct advantage of this approach is that it is easily extended to examine the issue of multiple displacements, through techniques such as the bivariate probit model. The bivariate probit approach is particularly attractive since it provides an explicit measure of the relatedness of job loss over time. Estimates from these models are consistent with the idea that layoffs provide a stronger signal of worker quality, when workers are less likely to lose their jobs. This insight is consistent with the stylized fact of the job displacement literature that the costliness of job loss varies widely. My results suggest that some of this variation is due to the fact that firms understand that the value of a layoff as a signal of worker productivity depends upon the circumstances surrounding the job loss.

[13] The first estimated coefficient is statistically significant at the 5 percent level, the second at the 10 percent level.

TABLE 1: Descriptive Statistics (Means) for Selected Variables (1984, 1994)	All Non-Displaced Workers	All Displaced	Laid-off Workers	Plant Closing Workers
1984 Variables				
Unemployment rate (annual average, 1984)	8.48	8.74	8.81	8.63
	(3.13)	(3.31)	(3.37)	(3.15)
Race (nonwhite=1)	0.27	0.33	0.32	0.34
	(0.44)	(0.47)	(0.46)	(0.47)
Highest Grade Completed (1984)	12.77	11.93	11.89	12.23
	(1.94)	(1.79)	(1.73)	(2.14)
Labor Market Experience (weeks, 1984)	214.22	190.32	189.10	205.18
	(105.73)	(100.19)	(97.64)	(104.86)
Job Tenure (weeks, 1984)	124.88	93.84	90.25	117.13
	(96.26)	(85.22)	(83.09)	(95.21)
Age (years, 1984)	23.08	22.75	22.74	22.72
	(2.25)	(2.23)	(2.26)	(2.12)
Married (yes=1, 1984)	0.29	0.23	0.23	0.23
	(0.45)	(0.42)	(2.27)	(0.42)
Children (yes=1, 1984)	0.22	0.28	0.28	0.23
	(0.45)	(0.45)	(0.45)	(0.42)
1989 Variables				
Highest Grade Completed (1989)	13.25	12.19	12.13	12.57
	(2.38)	(1.98)	(1.94)	(2.23)
Labor Market Experience (weeks, 1989)	440.22	410.32	405.10	430.65
	(157.23)	(179.38)	(166.50)	(106.53)
Job Tenure (weeks, 1989)	246.47	135.51	135.91	152.25
	(169.60)	(112.80)	(113.21)	(124.53)
Married (yes=1, 1989)	0.55	0.47	0.46	0.57
	(0.49)	(0.50)	(0.49)	(0.49)
Children (yes=1, 1989)	0.48	0.52	0.51	0.54
	(0.50)	(0.50)	(0.50)	(0.50)

1994 Variables				
Real Hourly Wage (1994, in 1992 dollars)	14.54	11.29	10.99	13.69
	(11.10)	(10.49)	(6.92)	(15.88)
Labor Market Experience (weeks, 1994)	680.51	645.72	637.60	665.02
	(183.86)	(152.65)	(151.73)	(141.34)
Job Tenure (weeks, 1994)	371.29	196.65	195.42	224.33
	(243.74)	(157.43)	(160.73)	(152.10)
Number of Observations	1430	795	574	134

Standard deviations are in parentheses. All means are for those workers in the sample, as described in the text of this paper.

TABLE 2: Probit Estimates, for Selected Sample of Male Workers (1984-1993)

	(1)	(2)	(3)
Variables (Dependent Variable=1 if Displacement)	**All Displaced**	**Layoffs**	**Plant close**
Urate (state unemployment rate, 1984)	0.012	0.015	0.007
	(1.30)	(1.46)	(0.44)
Race (nonwhite=1)	0.097	0.036	0.148
	(1.46)	(0.49)	(1.37)
Highest grade Completed (as of 1984)	-0.100	-0.105	-0.063
	(5.84)***	(5.61)***	(2.31)**
Married (as of 1984)	-0.241	-0.268	0.008
	(2.99)***	(2.98)***	(0.06)
Any Children (as of 1984)	0.223	0.242	-0.028
	(2.83)***	(2.75)***	(0.21)
Tenure with Employer (as of 1984)	-0.004	-0.005	-0.002
	(4.30)***	(4.50)***	(1.10)
Tenure Squared	0.000	0.000	0.000
	(2.45)**	(2.66)***	(0.79)
Experience (as of 1984)	0.002	0.003	0.000
	(1.74)*	(2.34)**	(0.30)
Experience (as of 1984)	-0.000	-0.000	-0.000
	(2.00)**	(2.70)***	(0.39)
Occupational dummy, clerical (as of 1984)	-0.000	0.027	-0.102
	(0.00)	(0.23)	(0.68)
Occupational dummy, laborer (as of 1984)	0.264	0.323	-0.067
	(2.79)***	(3.04)***	(0.49)
Occupational dummy, service (as of 1984)	0.093	0.125	-0.096
	(0.84)	(1.01)	(0.59)
Industry dummy, agg. and min. (as of 1984)	0.460	0.546	0.042
	(3.35)***	(3.72)***	(0.16)
Industry dummy, const. (as of 1984)	0.514	0.622	-0.366
	(4.36)***	(4.93)***	(1.31)
Industry dummy, other manuf. (as of 1984)	0.257	0.253	0.233
	(3.52)***	(3.12)***	(2.04)**
Industry dummy, other service (as of 1984)	0.129	0.123	0.046
	(0.99)	(0.84)	(0.23)
South Region (as of 1984)	-0.069	-0.061	-0.098
	(0.85)	(0.68)	(0.76)
West Region (as of 1984)	0.120	0.091	0.099
	(1.29)	(0.89)	(0.68)
North Central Region (as of 1984)	-0.035	-0.039	0.015
	(0.39)	(0.39)	(0.11)
Constant	0.571	0.339	-0.639
	(1.97)**	(1.06)	(1.42)
Number of Observations	2225	2004	1564

Absolute value of robust clustered t statistics are in parentheses, * significant at 10 % level, ** significant at 5% level, *** significant at the 1% level.

TABLE 3: Hourly Wage Regressions, for Male Workers (1994), Using First-Stage Probit

	(1)	(2)	(3)
	All Displaced	**Layoffs**	**Plant close**
Variables (Dependent Variable is ln(hourly wage)	ln(wage)	ln(wage)	ln(wage)
Observed Displaced, Predicted Displaced	-0.044	-0.030	-0.064
	(1.57)	(0.96)	(1.60)
Observed Displaced, Not Predicted Displaced	-0.077	-0.090	-0.033
	(2.19)**	(2.24)**	(1.10)
Not Observed Displaced, Predicted Displaced	0.060	0.065	0.063
	(1.01)	(1.14)	(1.02)
Urate (state unemployment rate, 1984)	-0.008	-0.008	-0.008
	(2.07)**	(1.91)	(1.62)
Race (nonwhite=1)	-0.085	-0.089	-0.045
	(3.86)***	(3.75)***	(1.63)
Highest grade Completed (as of 1994)	0.055	0.056	0.058
	(9.63)***	(9.30)***	(8.39)***
Tenure with Employer (as of 1994)	0.001	0.001	0.001
	(7.18)***	(6.58)***	(5.27)***
Tenure Squared	-0.000	-0.000	-0.000
	(5.61)***	(5.25)***	(4.26)***
Experience (as of 1994)	0.001	0.002	0.001
	(3.77)***	(3.85)***	(3.18)***
Experience (as of 1994)	-0.000	-0.000	-0.000
	(2.19)**	(2.20)**	(1.92)
Occupational dummy, clerical (as of 1994)	-0.146	-0.147	-0.128
	(4.10)***	(3.90)***	(3.11)***
Occupational dummy, laborer (as of 1994)	-0.155	-0.148	-0.153
	(6.01)***	(5.47)***	(5.06)***
Occupational dummy, service (as of 1994)	-0.264	-0.255	-0.288
	(7.10)***	(6.53)***	(6.51)***
Industry dummy, agg. and min. (as of 1994)	-0.133	-0.176	-0.118
	(1.96)	(2.38)**	(1.28)
Industry dummy, const. (as of 1994)	0.145	0.141	0.059
	(4.09)***	(3.64)***	(1.20)
Industry dummy, other manuf. (as of 1994)	-0.009	-0.012	0.010
	(0.40)	(0.50)	(0.38)
Industry dummy, other service (as of 1994)	-0.220	-0.206	-0.114
	(2.59)***	(2.24)**	(1.01)
South Region (as of 1994)	-0.026	-0.035	-0.025
	(0.78)	(0.98)	(0.61)
West Region (as of 1994)	-0.146	-0.142	-0.141
	(4.69)***	(4.28)***	(3.74)***
North Central Region (as of 1994)	-0.208	-0.209	-0.221
	(7.19)***	(6.82)***	(6.11)***
Constant	1.757	1.725	1.704
	(17.15)***	(16.17)***	(12.98)***
Number of Observations	2225	2004	1564

Absolute value of robust clustered t statistics are in parentheses, * significant at 10 % level, ** significant at 5% level, *** significant at the 1% level.

TABLE 4: Bivariate Probit Estimates, All Displacements, Male Workers (1984-1993)

Variable (Depended Variable =1 if Displacement)	(1) Period 1 (1984-1988)	(2) Period 2 (1989-1993)
Urate (state unemployment rate, 1984)	0.002	0.017
	(0.21)	(0.90)
Race (nonwhite=1)	-0.000	0.102
	(0.00)	(1.32)
Highest grade Completed (start of period)	-0.081	-0.048
	(4.66)***	(2.61)***
Married (start of period)	-0.295	-0.098
	(3.33)***	(1.29)
Any Children (start of period)	0.323	0.078
	(3.87)***	(1.03)
Tenure with Employer (start of period)	-0.004	-0.003
	(4.19)***	(4.36)***
Tenure Squared (start of period)	0.000	0.000
	(1.91)*	(2.25)**
Experience (start of period)	0.002	-0.000
	(2.20)**	(0.00)
Experience (start of period)	-0.000	-0.000
	(2.05)**	(0.46)
Occupational dummy, clerical (start of period)	0.047	0.105
	(0.39)	(0.82)
Occupational dummy, laborer (start of period)	0.334	0.303
	(3.26)***	(2.93)***
Occupational dummy, service (start of period)	0.159	0.169
	(1.33)	(1.24)
Industry dummy, agg. and min. (start of period)	0.468	0.294
	(3.34)***	(1.65)*
Industry dummy, const. (start of period)	0.545	0.458
	(4.48)***	(3.85)***
Industry dummy, other manuf. (start of period)	0.233	0.105
	(2.93)***	(1.16)
Industry dummy, other service (start of period)	0.286	-0.079
	(2.10)**	(0.37)
South Region (start of period)	-0.027	0.032
	(0.33)	(0.36)
West Region (start of period)	0.140	0.151
	(1.57)	(1.47)
North Central Region (start of period)	-0.055	0.217
	(0.56)	(2.03)**
Constant	-0.027	-0.406
	(0.09)	(1.15)
Rho	0.061	
Wald test of Rho=0 (Chi squared [1])	2.55*	
Number of Observations	2225	2225

Absolute value of robust clustered t statistics are in parentheses, * significant at 10 % level, ** significant at 5% level, *** significant at the 1% level.

TABLE 5: Bivariate Probit Estimates, Only Layoffs, Male Workers (1984-1993)

Variable (Depended Variable =1 if Displacement)	(1) Period 1 (1984-1988)	(2) Period 2 (1989-1993)
Urate (state unemployment rate, 1984)	0.007	0.017
	(0.68)	(0.90)
Race (nonwhite=1)	-0.070	0.074
	(0.88)	(0.85)
Highest grade Completed (start of period)	-0.088	-0.057
	(4.49)***	(2.76)***
Married (start of period)	-0.310	-0.179
	(3.14)***	(2.07)**
Any Children (start of period)	0.365	0.063
	(3.88)***	(0.73)
Tenure with Employer (start of period)	-0.004	-0.003
	(4.19)***	(3.32)***
Tenure Squared (start of period)	0.000	0.000
	(2.37)**	(1.36)
Experience (start of period)	0.003	0.000
	(2.50)**	(0.63)
Experience (start of period)	-0.000	-0.000
	(2.63)***	(1.19)
Occupational dummy, clerical (start of period)	0.022	0.114
	(0.16)	(0.77)
Occupational dummy, laborer (start of period)	0.363	0.375
	(3.11)***	(3.12)***
Occupational dummy, service (start of period)	0.192	0.099
	(1.43)	(0.61)
Industry dummy, agg. and min. (start of period)	0.508	0.228
	(3.33)***	(1.13)
Industry dummy, const. (start of period)	0.591	0.537
	(4.47)***	(4.08)***
Industry dummy, other manuf. (start of period)	0.202	0.082
	(2.25)**	(0.80)
Industry dummy, other service (start of period)	0.246	0.013
	(1.60)	(0.05)
South Region (start of period)	0.109	0.028
	(1.10)	(0.59)
West Region (start of period)	0.244	-0.163
	(2.19)**	(1.24)
North Central Region (start of period)	.014	-0.224
	(1.13)	(1.89)*
Constant	-0.308	-0.302
	(0.89)	(0.77)
Rho	0.110	
Wald test of Rho=0 (Chi squared [1])	4.08**	
Number of Observations	2004	2004

Absolute value of robust clustered t statistics are in parentheses, * significant at 10 % level, ** significant at 5% level, *** significant at the 1% level.

TABLE 6: Bivariate Probit Estimates, Only Plant Closings, for Selected Sample of Male Workers (1984-1993)

Variable (Depended Variable =1 if Displacement)	(1) Period 1 (1984-1988)	(2) Period 2 (1989-1993)
Urate (state unemployment rate, 1984)	-0.016	0.025
	(0.91)	(0.69)
Race (nonwhite=1)	0.095	0.253
	(0.75)	(1.74)*
Highest grade Completed (start of period)	-0.057	-0.022
	(1.98)**	(0.70)
Married (start of period)	0.020	0.370
	(0.13)	(2.57)**
Any Children (start of period)	-0.079	-0.098
	(0.50)	(0.82)
Tenure with Employer (start of period)	-0.003	-0.004
	(1.57)	(3.16)***
Tenure Squared (start of period)	0.000	0.000
	(0.48)	(2.31)**
Experience (start of period)	0.003	-0.000
	(1.29)	(0.65)
Experience (start of period)	-0.000	0.000
	(1.05)	(0.73)
Occupational dummy, clerical (start of period)	-0.023	-0.125
	(0.13)	(0.60)
Occupational dummy, laborer (start of period)	0.018	-0.039
	(0.11)	(0.22)
Occupational dummy, service (start of period)	-0.074	-0.069
	(0.37)	(0.28)
Industry dummy, agg. and min. (start of period)	0.343	-0.140
	(1.24)	(0.35)
Industry dummy, const. (start of period)	-0.043	0.100
	(0.15)	(0.36)
Industry dummy, other manuf. (start of period)	0.373	0.265
	(2.66)***	(1.63)
Industry dummy, other service (start of period)	0.274	-0.123
	(1.20)	(0.29)
South Region (start of period)	-0.195	0.051
	(1.37)	(0.31)
West Region (start of period)	-0.016	0.184
	(0.10)	(0.96)
North Central Region (start of period)	-0.004	0.199
	(0.03)	(1.03)
Constant	-1.004	-1.478
	(1.92)*	(2.32)**
Rho	0.045	
Wald test of Rho=0 (Chi squared [1])	0.143	
Number of Observations	2225	2225

Absolute value of robust clustered t statistics are in parentheses, * significant at 10 % level, ** significant at 5% level, *** significant at the 1% level.

TABLE 7: Hourly Wage Regressions, for Male Workers (1994), Using First-Stage Bivariate Probit			
	(1)	(2)	(3)
	All Displaced	**Layoffs**	**Plant close**
Variables (Dependent Variable is ln(hourly wage)	ln(wage)	ln(wage)	ln(wage)
Observed Displaced, Predicted Displaced (Period 1)	-0.079	-0.074	-0.116
	(2.52)**	(2.27)**	(2.38)**
Observed Displaced, Not Predicted Displaced (Period 1)	-0.087	-0.101	-0.103
	(2.40)**	(2.27)**	(1.62)
Not Observed Displaced, Predicted Displaced (Period 1)	-0.025	-0.027	-0.032
	(0.91)	(0.94)	(1.12)
Observed Displaced, Predicted Displaced (Period 2)	-0.033	-0.039	-0.041
	(0.92)	(1.45)	(0.56)
Observed Displaced, Not Predicted Displaced (Period 2)	-0.081	-0.120	0.035
	(1.49)	(1.90)*	(0.27)
Not Observed Displaced, Predicted Displaced (Period 2)	-0.050	-0.059	0.030
	(1.83)*	(1.98)**	(1.05)
Urate (state unemployment rate, 1984)	-0.008	-0.008	-0.009
	(2.13)**	(1.96)**	(1.82)*
Race (nonwhite=1)	-0.082	-0.086	-0.061
	(3.79)***	(3.68)***	(2.17)**
Highest grade Completed (as of 1994)	0.055	0.055	0.061
	(9.58)***	(9.12)***	(9.51)***
Tenure with Employer (as of 1994)	0.001	0.001	0.001
	(7.10)***	(6.50)***	(5.41)***
Tenure Squared	-0.000	-0.000	-0.000
	(5.69)***	(5.35)***	(4.35)***
Experience (as of 1994)	0.001	0.002	0.001
	(3.84)***	(3.87)***	(3.46)***
Experience (as of 1994)	-0.000	-0.000	-0.000
	(2.21)**	(2.21)**	(2.10)**
Occupational dummy, clerical (as of 1994)	-0.143	-0.142	-0.125
	(4.01)***	(3.77)***	(3.02)***
Occupational dummy, laborer (as of 1994)	-0.155	-0.147	-0.151
	(5.92)***	(5.35)***	(4.99)***
Occupational dummy, service (as of 1994)	-0.259	-0.248	-0.287
	(6.84)***	(6.17)***	(6.47)***
Industry dummy, agg. and min. (as of 1994)	-0.129	-0.170	-0.117
	(1.91)*	(2.32)**	(1.27)
Industry dummy, const. (as of 1994)	0.148	0.150	0.058
	(4.19)***	(3.90)***	(1.17)
Industry dummy, other manuf. (as of 1994)	-0.009	-0.010	-0.000
	(0.41)	(0.40)	(0.02)
Industry dummy, other service (as of 1994)	-0.210	-0.199	-0.111
	(2.42)**	(2.14)**	(0.98)
South Region (as of 1994)	-0.026	-0.037	-0.035
	(0.78)	(1.03)	(0.85)
West Region (as of 1994)	-0.151	-0.146	-0.145
	(4.79)***	(4.36)***	(3.73)***
North Central Region (as of 1994)	-0.208	-0.210	-0.217
	(7.16)***	(6.76)***	(5.94)***
Number of Observations	2225	2004	1564

Absolute value of robust clustered t statistics are in parentheses, * significant at 10 % level, ** significant at 5% level, *** significant at the 1% level. A constant has also been included in estimated equations.

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